

## CLAIMS

What is claimed is:

1. An electrical circuit apparatus comprising:
  - 5 a substrate comprising a ground layer, at least one device aperture, and at least one solder aperture;
  - a heat sink; and
  - an adhesive layer for mechanically coupling said heat sink to the ground layer of said substrate such that at least a portion of the substrate device aperture overlaps said heat sink, said adhesive layer comprising at least one device aperture and at least one solder aperture, wherein aligning the at least one substrate solder aperture with the at least one adhesive layer solder aperture and aligning the at least one substrate device aperture with the at least one adhesive layer device aperture enables solder wetting in a predetermined area between said
  - 10 heat sink and the ground layer of said substrate.
2. The apparatus of Claim 1 further comprising a device coupled to said heat sink, wherein at least a portion of said device is located within the substrate device aperture.
- 20 3. The apparatus of Claim 2, wherein said device is a power device comprising at least one input terminal and at least one output terminal, and at least a portion of said predetermined area is located beneath said power device.
- 25 4. The apparatus of Claim 3, wherein a first portion of said predetermined area is located beneath said at least one input terminal and a second portion of said predetermined area is located beneath said at least one output terminal.
5. The apparatus of Claim 2, wherein said device is a power transistor.

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6. The apparatus of Claim 2, wherein said device is coupled to said heat sink and said solder wetting occurs during a single pass solder reflow process.
7. The apparatus of Claim 6, wherein said solder reflow process uses a no-  
5 lead solder.
8. The apparatus of Claim 6, wherein said solder reflow process uses a leaded solder.
- 10 9. The apparatus of Claim 1, wherein said adhesive layer comprises an electrically non-conducting material.
10. The apparatus of Claim 9, wherein said electrically non-conductive material is acrylic.
- 15 11. The apparatus of Claim 1, wherein said substrate is an organic circuit board.
12. The apparatus of Claim 1, wherein said adhesive layer has a predetermined  
20 thickness.

13. An electrical circuit apparatus comprising;
  - a substrate comprising a ground layer, at least one device aperture, and at least one solder aperture;
  - a heat sink;
- 5 an adhesive layer for mechanically coupling said heat sink to the ground layer of said substrate such that at least a portion of the substrate device aperture overlaps said heat sink, said adhesive layer comprising at least one device aperture and at least one solder aperture; and
- 10 a device coupled to said heat sink, wherein at least a portion of said device is located within the substrate device aperture, and wherein aligning the at least one substrate solder aperture with the at least one adhesive layer solder aperture and aligning the at least one substrate device aperture with the at least one adhesive layer device aperture enables solder wetting in a predetermined area between said heat sink and the ground layer of said substrate, and wherein at least
- 15 a portion of said predetermined area is located beneath said device.

14. An electrical circuit apparatus comprising;  
an organic circuit board comprising a ground layer, at least one device  
aperture, and at least one solder aperture;  
a heat sink;
- 5       an adhesive layer for mechanically coupling said heat sink to the ground  
layer of said substrate such that at least a portion of the substrate device aperture  
overlaps said heat sink, said adhesive layer having a predetermined thickness and  
comprising at least one device aperture and at least one solder aperture; and
- 10      a power transistor comprising at least one input terminal and at least one  
output terminal and coupled to said heat sink, wherein at least a portion of said  
power transistor is located within the substrate device aperture, and wherein  
aligning the at least one substrate solder aperture with the at least one adhesive  
layer solder aperture and aligning the at least one substrate device aperture with  
the at least one adhesive layer device aperture enables solder wetting in a  
15      predetermined area between said heat sink and the ground layer of said substrate,  
and wherein a first portion of said predetermined area is located beneath said at  
least one input terminal and a second portion of said predetermined area is located  
beneath said at least one output terminal of said power transistor.

15. A method for assembling an electrical circuit apparatus comprising a substrate having a ground layer, at least one device aperture, and at least one solder aperture, a heat sink, and an adhesive layer having at least one device aperture and at least one solder aperture, said method comprising the steps of:

- 5       a) aligning the at least one substrate solder aperture with the at least one adhesive layer solder aperture and aligning the at least one substrate device aperture with the at least one adhesive layer device aperture;
- 10      b) mechanically coupling said heat sink to the ground layer of said substrate using said adhesive layer such that at least a portion of the substrate device aperture overlaps said heat sink;
- 15      c) filling at least a portion of said at least one adhesive layer solder aperture and at least a portion of said adhesive layer device aperture with solder; and
- 20      d) performing a process for solder wetting, wherein the aligning of the at least one substrate solder aperture with the at least one adhesive layer solder aperture and the aligning of the at least one substrate device aperture with the at least one adhesive layer device aperture causes said solder to flow from said solder apertures to a predetermined area between said heat sink and the ground layer of said substrate.

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16. The method of Claim 15, wherein said electrical circuit apparatus further comprises a device, and wherein said method further comprises the step after step c) of mounting said device into said substrate such that at least a portion of said device is located within the substrate device aperture and such that said device is coupled to said heat sink.

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17. The method of Claim 16, wherein said device is coupled to said heat sink and said solder wetting occurs during a single pass solder reflow process.

18. The method of Claim 17, wherein said solder reflow process uses a no-lead solder.
19. The method of Claim 17, wherein said solder reflow process uses a leaded  
5 solder.
20. The method of Claim 15, wherein at least a portion of the steps of said method are performed as part of an automated process.
- 10 21. The method of Claim 15, wherein at least a portion of the steps of said method are performed manually.